Lab Manual: 02

Lab Topic: Introducing Basics of Elementary Programming in Java

Course Code: CSE 1116 (Object Oriented Programming Laboratory)

Course Instructor: Mir Moynuddin Ahmed Shibly, Lecturer, CSE

Lab Objective

- **Understand** basic program structure in Java
- **Solve** a few simple problems in Java.
- **Solve** problems using selection statement

Lab Activities

A. Reading inputs from user

- Everything in Java comes in the form of a class.
- To read inputs from a user, we need to use the Scanner class.
- The following program reads the name, age and department name of a student and prints them accordingly.

```
import java.util.Scanner;
class SampleReadInput{
 public static void main (String[] args){
    Scanner input = new Scanner (System.in);
    System.out.println("Enter your name: ");
    String name = input.next();
    System.out.println("Enter your age: ");
    int age = input.nextInt();
    System.out.println("Enter your CGPA: ");
    double cgpa = input.nextDouble();
    System.out.println("Enter your department: ");
    String department = input.nextLine();
    System.out.printf("Your Name: %s\n", name);
    System.out.printf("Your Age: %d\n", age);
    System.out.printf("Your CGPA: %f\n", cgpa);
    System.out.printf("Your Deparmtent: %s\n", department);
  } // main method ends
} // Main class ends
```

- **Does the program execute as we have wanted? What is the problem? How can you solve it?**

B. Reading Inputs and Writing Outputs using Dialog Box (JOptionPane)

- JOptionPane is a built-in Java class that makes it easy to pop up a standard dialog box that prompts user for a value or informs them of something. JOptionPane class has the following methods.

Method Name	
showConfirmDialog	Asks a confirming question, like yes/no/cancel
showInputDialog	Prompts for some input
showMessageDialog	Tell the user about something that has happened
showOptionDialog	The grand unification of the above three

- Write the following Java program.

```
import javax.swing.*;
class SampleDialogBox1 {
 public static void main (String[] args){
   JOptionPane.showMessageDialog (null, "Hello World",
              "First Dialog",JOptionPane.INFORMATION_MESSAGE);
}
}
```

- Compile and execute the program. You will see the dialog box as shown in Figure 1.

Figure 1: A simple message dialog box

- Next, we will see the process of reading inputs from user through a dialog box.
- Write the following Java program.

```
import javax.swing.*;
class SampleDialogBox2 {
  public static void main (String[] args){
     String name = JOptionPane.showInputDialog (null,
          "Enter your name","Input
             name",JOptionPane.QUESTION_MESSAGE);
JOptionPane.showMessageDialog(null, "Your name is" + name,
      "Display name", JOptionPane.INFORMATION_MESSAGE);
  }
}
```

- Compile and execute the program. First, you will see the input dialog box as shown in Figure 2.

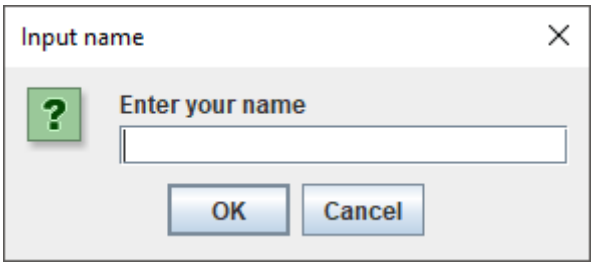

Figure 2: A simple input dialog box

- After you enter the name, the message dialog box as shown in Figure 3 will be displayed.

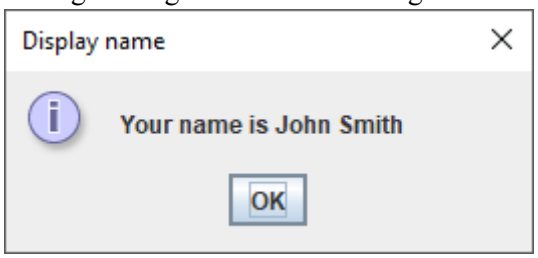

Figure 3: Dialog box shown after you enter name

- Write, compile and execute the following Java program.

```
import javax.swing.*;
class SampleDialogBox3 {
   public static void main (String[] args){
      String first = JOptionPane.showInputDialog (null,
                     "Enter first integer", "Input first integer",
                        JOptionPane.QUESTION_MESSAGE);
      int firstNumber = Integer.parseInt(first);
      String second = JOptionPane.showInputDialog (null,
                     "Enter second integer", "Input second integer",
                        JOptionPane.QUESTION_MESSAGE);
      int secondNumber = Integer.parseInt(second);
      int sum = firstNumber + secondNumber;
      JOptionPane.showMessageDialog(null, firstNumber + " + " +
           secondNumber + " = " + sum, "Result",
              JOptionPane.INFORMATION_MESSAGE);
   }
}
```

Lab Problems

01: Write a program that displays **Welcome to Java**, **Welcome to Computer Science**, and **Programming is fun** at three different lines.

02: Write a program that displays **Welcome to Java** five times in five lines.

03: Write a program that display the following table.

a	a^2	a^3
1	1	1
2	4	8
3	9	27

04: Write a program that display the result of,

$$\frac{9.5 \times 4.5 - 2.5 \times 3}{45.5 - 3.5}$$

05: Write a program that displays the area and perimeter of a circle that has a radius of **5.5** using the following formula:

perimeter = 2 * π * *radius*
area = π * *radius* * *radius*

06: Change the program in the previous problem (05) in such a way so that the user gives the value of the radius of the circle. Now compute the perimeter and area.

07: Assume a runner runs **14** kilometers in **45** minutes and **30** seconds. Write a program that displays the average speed in miles per hour. (Note that **1** mile is **1.6** kilometers.)

08: Change the program in the previous problem (03) in such a way so that the user gives three values: distance the runner completed in km, minutes and seconds spent during the run. Now compute the average speed in miles per hour.

09: Write a program that reads a Celsius degree in a **double** value from the console, then converts it to Fahrenheit and displays the result. The formula for the conversion is as follows:

*fahrenheit = (9 / 5) * celsius + 32*

10: Write a program that reads an integer from the console and determines whether the given number is divisible by either 2 or 3 (but not both). Then the program should print TRUE, otherwise, the program should print FALSE.

11: Write a program that prompts the user to enter the minutes (e.g., 1 billion), and displays the number of years and days for the minutes. For simplicity, assume a year has **365** days. Here is a sample run:

```
Enter the number of minutes: 1000000000 Enter
1000000000 minutes is approximately 1902 years and 214 days
```

12: The two roots of a quadratic equation $ax^2 + bx + c = 0$ can be obtained using the following formula:

$$r_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \text{and} \quad r_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

$b^2 - 4ac$ is called the discriminant of the quadratic equation. If it is positive, the equation has two real roots. If it is zero, the equation has one root. If it is negative, the equation has no real roots. Write a Java program that prompts the user to enter values for *a*, *b*, and *c* and displays the result based on the discriminant. If the discriminant is positive, display two roots. If the discriminant is **0**, display one root. Otherwise, display "The equation has no real roots".

Note that you can use **Math.pow(x, 0.5)** to compute the square root of x..

```
Enter a, b, c: 1.0 3 1 Enter
The equation has two roots -0.381966 and -2.61803
```

```
Enter a, b, c: 1.0 3 1 Enter
The equation has two roots -0.381966 and -2.61803
```

13: Write a Java program that prompts the user to enter the exchange rate from currency in U.S. dollars (USD) to Bangladeshi Taka (BDT). Prompt the user to enter **0** to convert from USD to BDT and **1** to convert from BDT to USD. Then, prompt the user to enter the amount in USD or in BDT to convert it to BDT or USD, respectively. Use appropriate JOptionPane dialog boxes to read inputs and write outputs.

14. Write a Java program that prompts the user to enter the center (**p**,**q**) and the radius (**r**) of a circle. Then, prompts the user to enter a point (**x**, **y**) and checks whether the point is within the circle centered at (**p, q**) with radius **r**. For example, (**4**, **5**) is inside the circle centered at (0,0) with radius 10 and (**9**, **9**) is outside the circle, as shown in the following figure.